A Publication of the Consultative Group on Biological Diversity

BIODIVERSITY

Summer 1997
Volume 7, Number 3

Biodiversity and the Emergence of Infectious Disease

Mark Walters, Geraldine R. Dodge Foundation

The emergence of infectious disease is among the most complex and frightening of ways that deteriorating natural environments (including altered biodiversity) can harm human health. According to a 1996 World Health Organization report, at least 30 new infectious diseases have emerged in the past 20 years, and many countries have seen a resurgence of old ones.

Many of these afflictions stem from the disrupted biodiversity, or the balance between animals that naturally carry the diseases and predators that keep these carriers in check. Even as destruction of habitat worldwide reduces the larger predators, climate changes may be enhancing the ability of many smaller carriers and vectors--insects, viruses, and rodents, for example--to survive and reproduce. Worse yet, the epidemics are occuring as thinning stratospheric ozone may be interferring with the human immune system. This is leading not only to increased suseptability of people to many kinds of malignancy, but also to reduced ability to fight off disease and decreased effectiveness of vaccines.

How does altered biodiversity effect human health so profoundly? In geologic time, the mass extinction of species has meant rapid leapts forward for many bioligical “opportunists”. This is especially true for small, rapidly reproducing and widely dispersed small organisms, who by nature are better opportunists than larger mammals (including ourselves). Therefore, times of great biological instability, as we are now experiencing, usually favor small organisms over the large. As the loss of species disrupts long-established biological checks-and-balances between predators and their prey, as well as between invaders-and-hosts, the microbes gain a decisive advantage over larger, slower evolving mammals. Small organisms call it victory; we call it infectious disease.

A few examples might illustrate the connection between the emergence of infectious diseases and altered biodiversity.

Hantavirus. Six years of drought in the southwestern United States ended in the spring of 1993 with unusually heavy snows and rains, a climate change perhaps inspired by El Niño and greenhouse-gas emissions. While the heavy precipitation led to an abundance of food (piñon nuts and grasshoppers) for the native deer mice, the drought had slashed the number of predators, such as foxes, snakes, and owls. More food and fewer predators led to a tenfold population explosion in deer mice. Deer mice shed hantavirus through their saliva and excreta. The greatly increased exposure of people to the huge mouse population caused an epidemic of this rapidly fatal respiratory syndrome. Seventeen people, most of them Native Americans, initially fell ill; 13 died. Since this epi-

(continued on page 2)

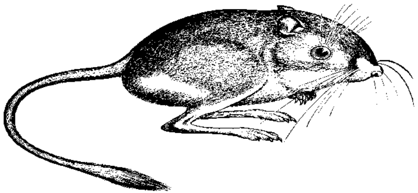
demic, 162 cases in 27 states have been confirmed by the Centers for Disease Control and Prevention (the CDC), with about half the people dying. Lesson: The alteration of biodiversity through climate changes can have grave health consequences for people.

The *"Cell from Hell"*. A number of major fish-kills (flounder, menhaden, mullet, eel, blue crabs, striped bass) along the southeastern Atlantic coast have been linked to a newly discovered dinoflagellate, Pfiesteria piscicida. Lethal to fish, human exposure to the cells (in the laboratory and possibly on fishing vessels) has been associated with mental confusion, respiratory distress with asthma-like symptoms, severe stomach cramping, nausea, vomiting, eye irritation and blurred vision, erratic heart beat, and central nervous system dysfunction including sudden rages and personality change, as well as short-term memory loss, and a host of chronic effects, including tingling or numbness in lips, hands and feet that can last for years. Outbreaks of the kills seem to be associated with changing environmental conditions. In the laboratory, phosphorus enrichment (which often accompanies nutrient-rich runoff from farms, for example) directly stimulates the dinoflagellate. Based upon the circumstantial evidence so far, it's no surprise that the outbreaks have occurred in warm, shallow, poorly flushed estuaries that have received just such nutrient enrichment from farms. Once again, altered marine biodiversity apparently gave small opportunists the chance to "strike" at larger species.

> "Small organisms call it victory; we call it infectious disease"

Lyme Disease. Lyme disease, a major public health issue in the United States, is rarely thought of as an "environmental disease." Yet, its transmission to people has resulted largely from disruption of the biological equilibrium between the ticks that transmit it and its normal hosts, especially deer and deer mice. Reforestation in the eastern U.S. and the lack of natural predators such as wolves have led to huge increases in the number of suburban deer. People have become unwitting substitutes for the wild natural hosts. From this perspective, Lyme disease is an environmental as well as a medical affliction.

Leishmaniasis. Worldwide, leishmaniasis, a painful, disfiguring and sometimes fatal protozoal disease, affects over 12 million people. The cutting down of tropical rainforests and the building of villages displaces forest rodents, depriving sandflies (which carry the protozoa) of their usual hosts and causing them to turn temporarily to biting humans. The World Health Organization reports that deforestation, dams, agricultural development, roads, and other "ecological upheavals" contribute to the proliferation of the disease.



Malaria. It has been hypothesized that malaria became a major public health problem several thousand years ago in western Africa when early "slash and burn" agriculture encroached upon the rainforests. The newly cleared areas favored the breeding of the malaria-carrying mosquito, Anopheles gambiae, which fed mostly on human beings, over the more omnivorous mosquito species that were less able to adapt to the new environments. The plot in the saga of this ancient plague may still be thickening. If the thinning ozone layer is playing a role in reducing the numbers of mosquito-eating amphibians, then the interdependence of altered biodiversity and human health could not be any clearer.

Reframing the emergence of diseases as an environmental rather than purely medical or public health issue offers many benefits. The "environmental prevention" of disease stands to focus solutions on root causes rather than on symptoms. The perspective bridges disciplines that have been traditionally (and arbitrarily) segregated, such as ecology, human and veterinary medicine, and conservation biology. Human disease is an issue everyone can relate to. The issue of emerging disease is a powerful educational tool. Perhaps more than any other single issue, it helps to topple the widespread misconception that people are somehow separate from the natural environment.

Altered biodiversity reverberates far beyond the forests and wilderness areas we commonly associate with it. Through emerging diseases, the loss of biodiversity profoundly impacts our everyday lives. As the destruction of species and disrupted balance among the survivors send shudders through the web of life, humans find themselves at growing disadvantage. The environmental instability that may benefit viruses and other microscopic agents is proving to be very bad for us.

NCCP: A Model for National Habitat Conservation?

William B. Hull

In 1991, the State of California created the Natural Communities Conservation Planning (NCCP) program, attempting to resolve conflicts between protection of biological diversity and economic development through broad scale habitat conservation efforts. Although the program has been in effect for nearly six years, many questions continue regarding its long-term effectiveness in preserving threatened species and natural communities.

The initial test of the NCCP process is occurring in the coastal sage scrub ecosystem of southern California, an area encompassing over 6000 square miles in five counties and home to the California gnatcatcher and approximately 90 other potentially threatened or endangered species. The program brings together local, state and federal government officials; environmental organizations; business and industry representatives; and private landowners to develop NCCP plans. These plans attempt to preserve large, interconnected blocks of habitat important to a wide range of species and to integrate local, state and federal laws, resulting in a streamlined environmental permitting process.

NCCP plans are administered by local governments and special districts in cooperation with several federal and state agencies. Implementation agreements spell out the roles and responsibilities of each participant. Land purchases and exchanges, conservation easement acquisition, dedications of open space, and conservation banking are some of the long-term habitat protection means.

The overall NCCP process integrates at least 13 sub-regional plans, each with its own unwieldy name. To date, only one of the large sub-regional plans has been completed and received approval from state and federal wildlife agencies. The Orange County Central-Coastal NCCP Subregional Plan creates a 37,380 acre reserve system to protect the habitats of 39 plant and animal species. Because two large landowners controlled most of the private property and much of the land designated as habitat preserves had been previously set aside, the plan was relatively easy to negotiate.

In March, the San Diego City Council approved the Multiple Species Conservation Program, a habitat management plan that encompasses 582,000 acres and establishes a 172,000 acre preserve system. This subregional plan covers 85 species and 23 vegetation types and when combined with the two other San Diego County plans will cover a total of 1.3 million acres and provide protection for over two dozen indigenous plant and animal species. The total cost to purchase undeveloped land to implement the plan could exceed $300 million, a challenge for federal, state and local governments to raise. The plan has yet to be approved by federal and state officials.

Notwithstanding a generally favorable reception among many political and business leaders, opinions on the NCCP program are diverse. A sampling of this range of opinion was presented during a CGBD-sponsored NCCP panel discussion in San Francisco this May.

Michael Mantell, Undersecretary in the California Resources Agency, stressed the importance of a crisis, in this case the listing of the gnatcatcher as threatened, in forcing all the players to take a systematic approach to planning. Governments can act as a catalyst, but it is impossible for NCCP-type planning processes to weather the inevitable political and economic changes unless all participants are committed to a broadly-accepted, shared vision. Although

(continued on page 4)

state and federal governments must share in the financing of NCCPs, it is local government planning capabilities which are most important to the process. Pleased with the NCCP process in southern California, the Resources Agency is promoting it as a statewide model.

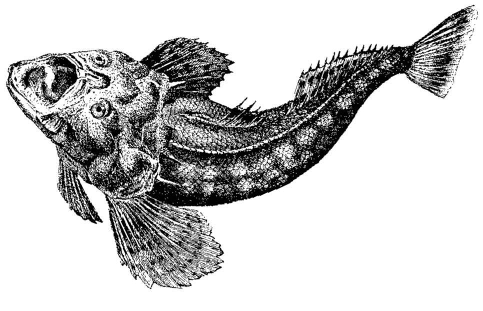
Monica Florian, Senior Vice President of Corporate Affairs for the Irvine Company, also lauded the NCCP process. She believes that the private sector has embraced the NCCP because it is multi-species, involves all levels of government, and addresses other issues in addition to endangered species considerations, thereby easing regulatory burdens on business and industry. Business interests particularly support "no surprise provisions" which assure that private parties will not have to provide additional land or money to implement any plan adjustments in the future.

Sounding a more cautious note was Dennis Murphy, President of the Center for Conservation Biology at Stanford University and member of the NCCP Scientific Review Panel. While acknowledging the NCCP process is a compromise between environmental and private property advocates, he emphasized the need for plans to: have clearly measurable biological goals; demonstrate how those goals will be attained; and, assure adequate monitoring of plan implementation. He stressed that scientists are troubled by the "no surprise policy", as the natural world is full of surprises and plans must be able to be amended to meet changing conditions. Dr. Murphy also emphasized the need for long-term funding, not subject to the vagaries of annual appropriation.

Although the Endangered Habitats League (EHL) has been deeply involved in the NCCP process, EHL Coordinator Dan Silver cautioned that the program is only one tool for local planning. In his opinion the NCCP has been successful in interjecting biological concerns into local deliberations, but he stressed that traditional, more-inclusive planning processes are necessary. He believes that ultimately California will need a statewide growth management strategy to effectively deal with urban and suburban sprawl.

A number of environmental organizations are participating in the NCCP process, but many continue to express reservations about aspects of the program and the related, but distinct, habitat conservation planning (HCP) program. While supportive of the proactive, large-scale effort of the NCCP, a recent report by the Natural Resources Defense Council recommends the following changes. The NCCP should be amended to ensure a sound biological basis for planning, with independent scientific involvement throughout the planning process. Public participation must be assured throughout every step of the planning process. Reserve design standards must be set which ensure species recovery, not merely survival. The "no surprises" policy must be modified to recognize that unforeseen circumstances may require further contributions from land owners.

As Congress prepares to consider reauthorization of the Endangered Species Act, some policymakers propose adopting NCCP-style planning on a national level. However, serious concerns exist regarding the process, particularly the scientific underpinnings of the plans and the substantial financial resources required for implementation. Ultimately, the success of the NCCP must be measured through the continued existence of the California gnatcatcher and the numerous other plant and animal species of the coastal sage scrub community. It remains to be seen whether, as US Interior Department Secretary Bruce Babbitt claims, the NCCP "will serve as a model for the rest of the nation, pointing the way to protect wildlife and conserve open space".



CGBD Annual Meeting

Educational presentations by distinguished speakers, strategy sessions for working groups, and a float trip on the Yellowstone River to learn more about the local environment highlighted the program of the CGBD Annual Meeting held June 11-13 in Chico Hot Springs, Montana. Forty four representatives from 30 foundations and the US Agency for International Development made this the best-attended Annual Meeting ever, indicating a growing interest among CGBD members to work collaboratively.

The plenary sessions opened with a presentation by Harvey Locke, Past President of the Canadian Parks and Wilderness Society, on protecting large landscapes. Locke focused his discussion on conservation in the northern Rockies, especially the Yellowstone-to-Yukon initiative and its applicability to other regions. Other plenary sessions addressed integrating changing economic perspectives into conservation and on-the-ground conservation efforts in Montana and the northern Rockies. Gene Karpinski of the US Public Interest Research Group provided an update on federal environmental policy developments, emphasizing the threat from “devolution”, and David Hunter of the Center for International Environmental Law and Charly Moore of the W. Alton Jones Foundation alerted members to the need for stronger focus on international conservation efforts.

Current CGBD Activities

The CGBD welcomed a new Board of Directors at the Annual Meeting in Chico Hot Springs in June. Members include: Beto Bedolfe, Homeland Foundation (Treasurer), Lois DeBacker, C.S. Mott Foundation (Vice President), Ann Krumboltz, Brainerd Foundation, Michael Lerner, Jenifer Altman Foundation, Andrew McElwaine, Vira I. Heinz Endowment, Michael Northrop, Rockefeller Brothers Fund (Secretary), Jeff Olson, Ford Foundation, Deborah Tuck, Ruth Mott Fund, and Jack Vanderryn, Moriah Fund (President).

BIODIVERSITY PROJECT
Two highly successful and engaging Biodiversity Project regional meetings were held in the Southeast on May 12-13 and the Mid Atlantic on June 24-25. Approximately 40 non-governmental organization (NGO) leaders attended each session, which focused on 1996 Biodiversity Poll briefings and included workshops on message development techniques and media skills. The Biodiversity Project anticipates further activity in bringing NGO’s together to improve the quality of public outreach.

On May 2, the Biodiversity Project held a meeting in San Francisco on increasing public awareness of sprawl, land use and habitat loss. Eighteen NGO experts generated ideas which will be used to develop questions for a series of focus groups. The findings from the sprawl meeting and the focus groups will be used for recommendations of a coordinated communication strategy on sprawl and biodiversity.

Jane Elder presented the initial findings of a Strategic Opportunities Analysis (or “roadmap”) at the CGBD Annual Meeting in June. The roadmap will assess six “pathways to awareness”, routes to reach the public with biodiversity messages. The roadmap will be a vital Biodiversity Project tool to continue working with funders and NGO leaders in broadening public awareness of biodiversity.

(continued on page 6)

CONSERVATION AND DEVELOPMENT

The Conservation & Development Working Group met at the Annual Meeting to discuss community-based efforts. Although interests are wide-ranging, there was clear focus on the need for three sessions in the coming year: one to discuss financial mechanisms for conservation-based development, another to look at urban models that address biodiversity conservation, and the third to further explore issues related to working in small communities. The Group will meet in Willapa Bay on October 7-8 to explore the financial mechanisms that are being developed there and elsewhere.

FORESTS

During the Spring, nearly all Forest Working Group sub-groups met by conference call to discuss a wide range of forest science, policy, and management issues. In discussions at the CGBD Annual Meeting, members agreed that another meeting, similar to that held in January, would be helpful.

The Community Strategies sub-group is planning a site-based session in October. The Capacity Building sub-group continues to discuss means to support forest protection organizers, advocates and scientists. The Sustainable Forestry/Certification sub-group met on June 17-19 in Pennsylvania with foresters, certifiers and conservation biologists. The Wood Use Reduction sub-group held two conference calls, and will continue to share information. The Conservation Science, Federal Policy and Private Forests sub-groups will continue to hold conference calls.

INTERNATIONAL

A group of International grantmakers met in an ad hoc session at the CGBD Annual Meeting. The large turn-out encouraged us to re-visit strategies for grantmakers whose interests are spread across the globe — but who want to work on common themes. There was easy consensus that we hold a funders briefing on Conservation Grantmaking in Mexico, which will be piggy-backed onto another session on Conservation in a Global Economy, looking at the impact of trade policies, international conventions and multilateral lenders on worldwide conservation efforts. These meetings will take place in Tucson in early December.

MARINES

On April 30, eight grantmakers met in San Francisco to discuss certification of marine fisheries in general and the Marine Stewardship Council (MSC) in particular. Several funders have commissioned a 20-page report on salmon aquaculture, including the environmental impacts of the practice. The report will provide background information of use to grantmakers and particularly to local activists concerned with the siting of aquaculture facilities. During the CGBD Annual Meeting, Working Group members agreed to continue focusing on the following issues during the next few months: regional fishery initiatives and implementation of the Magnuson Act; salmon aquaculture; and, certification of marine fisheries.

SYSTEMIC CONTAMINANTS

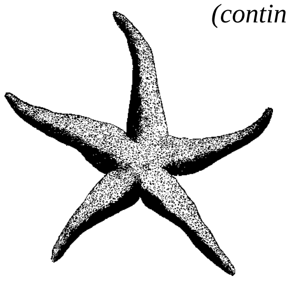
The Working Group on Systemic Contaminants also met at the CGBD Annual Meeting. Their focus remains clearly on outreach and strategies among grantmakers, trying to find a niche in current grantmaking guidelines for this serious new threat to wildlife and human health. The survey they commissioned of environment and health grantmakers is underway. A report and analysis will be completed by late August, detailing opportunities for funders in these overlapping fields. The group will meet in autumn to discuss the findings, and will co-sponsor a session at an upcoming Grantmakers in Health meeting in February.

CGBD Member News

The CGBD welcomes the Howard Gilman Foundation as a new member and looks forward to working with Pat Foster-Turley. The Gilman Foundation's conservation and environment program focuses on: *ex situ* and *in situ* conservation of threatened species; research opportunities for students in conservation biology, zoological medicine and environmental management; and workshops and conferences on conservation issues.

The Pew Charitable Trusts has brought Steve Kallick on board as their new Forest Program Officer.

(continued on page 7)



Jeff Glebocki joined the George Gund Foundation last fall as Project Officer in Education. Among his responsibilities will be K-12 environmental education.

Thomas B. Butler has joined the Moriah Fund staff as Program Assistant for Environment and Development where he will give special emphasis to Moriah's environmental grantmaking in Latin America.

BIODIVERSITY HOT SPOTS ON THE WEB

This month's Biodiversity web search focused on various water issues in honor of the passing of Jacques Yves Cousteau. The search was narrowed into three general topics: estuaries, rivers, and oceans.

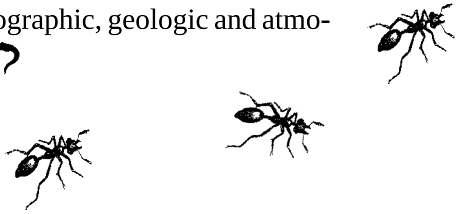
ESTUARIES
http://www.estuaries.org/
The Restore America's Estuaries web address is a great site to explore the status of and threats to national estuaries. The site also outlines current campaigns and techniques in restoring American estuaries.

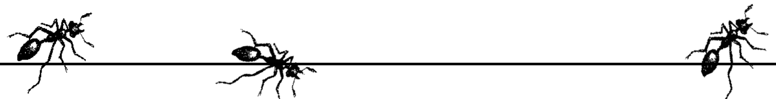
http://earth1.epa.gov/nep/nep.html
This site is derived from the EPA and is a report of national estuaries viewed regionally. The site, entitled National Estuary Program, provides data on the program, its goals, project summaries, an on-line newsletter and links to other estuary related sites.

RIVERS
http://www.irn.org/links/links.html
The International Rivers Network offers an excellent linking tool to several river affiliated organizations. By pulling up this page one can be instantly streamlined into valuable resources on river data including web sites that deal with development, river and environmental issues.

http://ww.highlands.com/RiverResource
River Resource is a site whose purpose is to provide gateways to all aspects of river information. The option of choosing links to river pages via subjects such as conservation organizations, watersheds, dams, canals, water quality and river assessments works well for a search of general river related information.

OCEANS
http://seagrant.orst.edu/otherwww.html
This Other Ocean and Coastal Resources address, by the Oregon Sea Grant, guides the visitor to research links on various marine topics. Some of these topics include biotechnology, coastal processes, community resources and economics, ocean productivity and fisheries, marine education, marine mammals, ocean and coastal law, policy and management, government agencies, and oceanographic, geologic and atmospheric sciences.





Upcoming Events

August 15-19. *Weaving Connections: Cultures and Environments*. Annual Conference of the North American Association for Environmental Education (Vancouver, BC). Contact Janet Thoreen, (937) 676-2514 or jthoreen@igc.apc.org

August 24-28. *Annual Meeting of the American Fisheries Society* (Monterey, CA). Contact Paul Brouha, (301) 897-8616 or pbrouha@fisheries.org

August 29-31. *Global Biodiversity Forum* (Montreal, Canada). Contact Laurence Christensen, IUCN, +41-22-999-0001 or ccm@hq.iucn.org

October 2-5. *Society of Environmental Journalists* (SEJ) Seventh National Conference (Tucson, AZ). Contact SEJ, (520) 621-7724 or ExtUniv@ccit.arizona.edu

October 27-30. *Second National Forum on Biodiversity*. Nature and Human Society (Washington, DC). Contact Tania Williams, NRC, (202) 334-2215 or tlwillia@nas.edu

November 12-15. *International Conference of the Society for Ecological Restoration* (Fort Lauderdale). Contact George Gann, (305) 247-1132 or ser1997@netrunner.net

THE CONSULTATIVE GROUP ON
BIOLOGICAL DIVERSITY

Presidio Building 1013
P.O. Box 29361
San Francisco, CA 94129-0361

Phone: 415/561-6575
Fax: 415/561-6490
E-mail: cgbd@cgbd.org

Catherine Porter, Executive Director

William Hull, Program Officer

Anita Daley, Program Assistant

Sam Fielding, Administrative Assistant

THE CONSULTATIVE GROUP ON
BIOLOGICAL DIVERSITY
Presidio Building 1013
P.O. Box 29361
San Francisco, CA 94129-0361